**Particle size effect on the permeability properties of nano-SiO2 blended Portland cement concrete.**

ABSTRACT

In this study, nano-SiO2 has been used as a high reactive pozzolan to develop the microstructure of the interfacial transition zone between the cement paste and the aggregate. Mechanical tests of blended cement-based concretes exposed that in addition of the pozzolanic reactivity of nano-SiO2 (chemical aspect), its particle grading (physical aspect) also revealed considerable influences on the blending effectiveness. It was concluded that the relative permeability reduction (relative to the control concrete made with plain cement) is higher for coarser nano-SiO2 after 90 days of moisture curing. However, finer nano-SiO2 particles showed better effects in early ages. These phenomena can be due to the free spacing between mixture particles that was associated with the global permeability of the blended cement-based concretes. This article presents the results of the effects of particle size ranges involved in nano-SiO2 blended Portland cement on the water permeability of concrete. It is revealed that the favorable results for coarser nano-SiO2 reflect enhanced particle packing formation accompanied by a reduction in porosity and particularly in particle spacing after 90 days.

**Keyword:** SiO2 nanoparticle; Nnanoparticle size; Permeability; Energy method; Concrete